THE USE OF INITIAL ENTRY DATA IN THE IDENTIFICATION OF HIGH RISK STUDENTS AT KANSAS STATE UNIVERSITY

by

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B.S., Kansas State University, 1973

A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

College of Education

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1979

Approved by:

Major Professor

ACKNOWLEDGEMENTS

I would like to thank Dr. Michael Holen for his contribution to this effort. His service as advisor and consultant is appreciated. I am grateful to Dr. Gerald Hanna for his guidance and instruction throughout my graduate program. I extend special thanks to Dr. Michael Lynch. He has been my teacher, my employer, my friend. I appreciate his guidance, his patience, his wit.

I shared many long, late hours at work on this project with fellow thesis-writers; I received encouragement from friends and co-workers. I thank them for their support.

Finally, I would like to thank my family. They are now and always have been a constant source of support and encouragement.

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CHAPTER ONE

INTRODUCTION

The recognition of college attrition as an issue of ever increasing importance in higher education has, in the past twenty years, generated a wave of attention to the phenomenon. Through the efforts of educational researchers theoretical models, predictive theories, identification systems, and programs of preventive measures have been developed. However, the complexity of the issue of attrition in terms of the definitions of the problem, related student and institutional characteristics, and immediate and long-term impacts on higher education accounts for a lack of a cohesive theoretical framework of attrition on which to build (Tinto, 1975).

The problem, when addressed in terms of a national sample of college students, is that for every ten students who enter a college, only four will graduate from that college four years later. Of the six who withdraw, three will do so during the first year, two will drop out during the second year, and the sixth one will withdraw at some point between the fifth and eighth semesters (Pantages and Creedon, 1978). It is this conceptualization of attrition that holds the greatest meaning for college and university administrators given the fiscal repercussions of declining enrollments. However, the underlying issue is one of interacting processes between individuals and the academic/social systems of the college or university.

In an attempt to provide the much needed theoretical framework necessary to investigate a phenomenon as complex as attrition, Tinto

(1975) developed a conceptual schema to outline the longitudinal processes involved in a student's voluntary withdrawal from college. Tinto suggests that during a student's stay in college, a continual process of interactions between the individual and the institution serves to modify the individual's commitment to personal educational goals in relation to the institution. It is through these continuing modifications in commitment that the decision to stay or withdraw is reached. According to Tinto's schema, students with diversified backgrounds (personal, family, ability, academic, social, etc.) enter college with varying degrees of commitment to an educational goal in general and to a particular institution. Within the academic and social systems of the institution, the student begins the integrative process. Integration into the academic system is gauged by intellectual development and grade performance. In the social system, the importance lies in the student's interactions with peers and with faculty. The degree to which student/system integration is achieved will modify the ongoing commitment to educational goals and to a specific institution.

Tinto's model provides a conceptual basis for attrition research which brings to focus the importance of the mutiple causality of attrition. The interactive effects of background, goal commitment, and institutional commitment are recognized as major determiners in the dropout decision. Given the complexity of the problem of attrition it is necessary to move beyond the theoretical base to a more empirical treatment in order to examine this multiple causality in terms of definitives.

When attrition is discussed on empirical bases, the theoretical generalizations previously mentioned begin to break down. The variations

among characteristics of higher education institutions and among the student populations they serve place severe limits on such generalizations. Descriptions and predictions soon become relatively institution-specific. Practical applications of attrition research begin on an intra-institutional level.

The present investigation examined the degree to which dropouts at Kansas State University (KSU) can be defined as a group and distinguished from those who remain. KSU is a public, state-supported, open-admission university with an enrollment of approximately 14,000 undergraduates. As an entering class of 2,600 freshmen does not lend itself to individualized attention, the need for an early-warning system for high-risk students takes on considerable importance.

At the time of initial entry, the University has considerable information on students through application/registration data and through the American College Testing Program's Examination, Interest Inventory, Student Profile Section, and Student Need Analysis Service. The purpose of the current study was to determine the extent to which high risk students could be identified on the basis of such initial entry data.

The complexity of the issue of attrition is acknowledged by educational researchers, and its effect on the generalizability of research findings recognized. As those variables predictive of attrition at one college may or may not have predictive potential for another student body, no attempt was made here to draw conclusions about the dropout-proneness of students other than those entering KSU. The characteristics of KSU in terms of its admissions policies, its educational orientation, and the population of prospective students on which it draws distinguishes

the University from other colleges. One of the basic premises of the investigation was that variables designated as predictive of attrition by related research would be predictive when measured for this population. It was also assumed that the distinctiveness of KSU students would generate unique predictive variables.

Arguments for more specific definitions of attrition are well-founded. Longitudinal efforts to reduce attrition must work under highly defined concepts of attrition; there is a need for distinction to be made between voluntary and involuntary dropouts, academic dismissals, transfers, stopouts, etc. However, the intent of this study was to provide a means of identifying students who leave KSU within their first two years. Subsequent studies of those students so identified may well lend themselves to making more refined distinctions.

It was not the intent of this study to formulate a predictive theorem that would function in an unaltered state indefinitely. However, it was assumed that the populations of students entering KSU each year share a great deal of commonality, and that this study's resultant prediction model could be applied to subsequent populations pending annual validation efforts.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Recent investigations of the characteristics of students who withdraw from college serve to document the impact of a number of factors while contradicting the effect of other factors in the dropout decision. These contradictions may be attributed to the diversity of samples in terms of the types of institutions studied, the definitions of dropouts, and other methodological factors. Because the purpose of this investigation was to delineate the characteristics of high-risk students based on information available to the Univeristy upon initial entry, a review of research on those factors is presented. As such, the major emphasis is placed on demographic and academic background factors with a somewhat more limited attention to motivational characteristics of students and student/institution match characteristics.

Age

The association of age of the entering student with attrition has yielded contradicting results. Much of the research suggests that attrition rates are similar for students who are either younger or older than the average age of the entering student, with those younger or older students having a higher risk of withdrawing (Bragg, 1956; Suddarth, 1962). Eckland (1964a) found that older students were more likely to graduate while Gonyea (1964) and Chase (1965) concluded that these older students were more likely to withdraw, a conclusion that was also reached by Summerskill and Darling (1955) earlier. Sexton (1965) purports that although freshmen students in the 17-19 age range had a better chance of persisting than

students who were older or younger, age is probably not a crucial factor in predicting attrition. In accordance with early works by Gable (1957) and Summerskill (1962), Pantages and Creedon (1978) agreed that age is not a primary determiner of attrition behavior.

Sex

The postulate that women students withdraw from college at a higher rate than men is supported by the work of many (Holmes, 1959; Astin, 1964; Spady, 1970; Cope, 1971; Astin, 1972; and Tinto, 1975). Panos and Astin (1968) reached a similar conclusion when they controlled for high school grade point average. A study conducted at KSU (Lynch and Downey, 1977) found that women students withdraw at a higher rate than males. Others (Iffert, 1957; Knoell, 1960; Hall, 1966; Nelson, 1966; and Demos, 1968) found that male students leave college at a higher rate than females. For the most part, these results are attributed to a higher academic dismissal rate for males. Among those whose research showed no differences in the dropout rates for men and women students are Summerskill and Darling (1955), Sewell and Shah (1967), and Johansson and Rossman (1973).

Marital Status

Information regarding the withdrawal rates of married students as compared to single students is somewhat more limited than that for other factors. Littrell's (1960) study found that married students were more likely to withdraw with married males withdrawing at a higher rate than married females. A more recent study by Panos and Astin (1968) supported this finding.

Military Status

The relationship of military status to attrition has fluctuated through

the years due to the changing status of the draft system. In 1964(a), Eckland found that male students who had completed their military duties before entering college had a better chance of finishing college than did those whose academic years were interrupted by tours of duty. Cope (1971) suggested that veterans are older and generally have more responsibilities than younger males and are, therfore, less likely to finish college. Research on the Viet-Nam era veterans is sketchy and is the subject of current studies.

Religion

Research relating religious affiliation to attrition suggests that religion seems to have predictive potential when considered along with other variables, most significantly sex. Summerskill and Darling (1955) found that Jewish males withdrew at a considerably lower rate than did Catholic or Protestant males. Cope's (1967) study of male students reported a 9% withdrawal rate for Jewish students, a 22% rate for Catholics, and a 44% withdrawal rate for Protestants. In that same study, Cope found that Jewish males are more likely to persist than Jewish females. Panos and Astin's (1968) study and Astin's (1973a and 1976) studies supported previous findings of low attrition rates for Jewish students. Cope's (1967) study and subsequent work by Rossman and Kirk (1970) and Astin (1976) suggested that atheists, agnostics, or those professing no formal religious beliefs are more likely to withdraw than those adhering to organized religions. The overview of research indicates sex differences in the religion/attrition relationship.

Race

In 1973(b), Astin examined racial differences in withdrawal rates holding

constant academic factors in the students' backgrounds. He found that Chicano students have a substantially lower probability of graduating than do black, Oriental, and American Indian students as a group, or Caucasian students. Astin's (1976) more recent work confirmed his previous findings on this relationship. Other studies of the race/attrition relationship confounded their results through failure to take high school rank, entrance test scores, etc. into account.

Socio-economic Status

A discussion of the relationship between students' family socio-economic status and attrition is complicated by the very concept of socio-economic status. Of the multitude of interrelated factors that define socio-economic status, three will be considered and examined with regard to their correlation with attrition behavior. The first of these factors is the occupation of the main wage earner of the family. Relatively few studies have investigated the influence of occupation alone on the persistence of the student. Rather, the occupation of the main wage earner has been viewed in conjunction with income. Those studies which looked at occupation as a separate factor have yielded conflicting results with Slocum (1956) and Bayer (1968) suggesting that students whose fathers held professional/technical/managerial jobs had an advantage in rate of success over other students, while Morrisey (1971) reported results in the opposite direction. Suddarth's (1962) original results which supported higher attrition rates for students with fathers in lower-leveled occupations were refuted when high school grade point averages were held constant for the students. Among those who found no significant relationship between father's occupation and attrition are Rossman and Kirk (1970).

The income of the student's family is closely related to occupation. Iffert (1957) isolated income and found that students from lower income families withdrew at a significantly higher rate than did those from higher income families. Eckland's (1964a) study supported the positive effect of family affluence on persistence as did Bayer's (1968) study and Astin's (1976) work. Note should be made again of Morrisey's (1971) contradictory results. In analyzing factors related to attrition, Astin (1973a) suggested that family income is not directly related to attrition.

The effect of parent's educational attainment on the persistence of students in higher education has been investigated in relation to occupation and income factors. Chase (1970) and Spady (1971) found a positive relationship between persistence of the student and parent's educational level. These results supported earlier findings of Pearlman (1962), Eckland (1965), Bayer (1968), and Panos and Astin (1968). Rossman and Kirk (1970) did not find evidence to support this relationship.

Residence

In examining the relationship between residence and attrition behavior, it is helpful to look at the several components of that factor. The distinction between students from rural backgrounds and students from urban areas has revealed differential attrition rates. Most research concluded that students from rural areas or small hometowns are more likely to withdraw than students from urban areas (Iffert, 1957; Summerskill, 1962; Cope, 1967; Gurin, Newcomb and Cope, 1968; Bayer, 1968; Cope, 1972; and Astin, 1976). The breaking point in community size was 50,000 for these studies. The distinction between out-of-state students and in-state students has yielded contradictory results when examined in relation to attrition

behavior. Iffert (1957) and Cope (1967) found higher persistence rates for out-of-state students; Wood (1963) concluded that out-of-state students are more likely to withdraw; and Chase (1965) found no significant relationship between in-state and out-of-state residence and attrition.

Attempts to correlate distance from home to college and attrition behavior resulted in Holmes' (1959) conclusion that students whose homes are closer to college will drop out, and Wood's (1963), Aiken's (1964), and Stordahl's (1967) conclusions that students whose homes are closer to campus will stay. Iffert (1957) had earlier suggested that the location of a student's home in relation to college had no significant bearing on his/her chance of staying in school. Later work by Fishman and Pasanella (1960), Gossman, Nobbe, Patricelli, Schmid, and Steahr (1968), and Johansson and Rossman (1973) supported Iffert's claim.

High School Background

Closely associated with the residence of entering students are the characteristics of the high schools these students attended. The size of the high school attended seems to be an important factor in differentiating attrition behaviors, only when the very smallest (less than 20) and the very largest (more than 900) graduating classes are considered (Anderson, 1974). In general, research supports the conclusion that there is no concrete relationship between size of high school and attrition.

The relationship between the type of high school and attrition has not been agreed upon in research. Sexton (1965) supported the findings of early studies by Davis and Fredericksen (1955) and Seltzer (1948) of a lower attrition rate for students who graduated from public high schools. More recent work by Astin (1973a) generated an opposite conclusion that

dropout rates are lower for students from private high schools. Because of the many common characteristics shared by private and public high schools, it is not possible at this time to make definitive statements about the relationship between type of high school and attrition.

High School Rank and Grade Point Average

High school performance has generally been found to differentiate potential dropouts from persisters. Early works by Bragg (1956), Slocum (1956), Little (1959), and Scannell (1960) tested the relationship and found that students with stronger academic backgrounds in high school were more likely to persist in college. More recent studies by Panos and Astin (1968), Chase (1970), Blanchfield (1971), Morrisey (1971), Astin (1973a), Tinto (1975), and Astin (1976) supported this finding. In a 1974 study, Demitroff stated that high school academic performance is the most reliable predictor of attrition. Criticisms of statements such as Demitroff's involve the use of an invalid equation of college persistence and college success as measured by academic performance. Eckland (1964b) and Schmid and Reed (1966) found that high school grades and rank in class are predictive of academic success in college but not predictive of persistence in college.

Aptitude

Research on scholastic aptitude, as measured by standardized college admissions tests, and its relationship to persistence in college has shown it to be a somewhat less stable predictor than high school grades and rank in class (Tinto, 1975; Astin, 1976). However, differences on measures of aptitude for dropouts and nondropouts have been cited by Lins and Pitt (1954), Marsh (1966), Slocum (1956), and Sewell and Shah (1967). While

the previously cited studies found significantly lower college admission test scores for dropouts, a number of investigators found no significant differences in scores for dropouts and nondropouts (Williams, 1966; Blanchfield, 1971).

Motivational Factors

Interrelationships among variables predictive of attrition behavior have been recognized in most every study of factors related to attrition. In addition to the interrelatedness of demographic characteristics of the students, it is undeniable that more intrinsic characteristics of the students are also interactive. As Tinto's (1975) model suggests, students enter college with varying degrees of commitment to educational goals. Those motivational factors which have lended themselves best to measurement are educational degree aspirations, expected performance levels, and degree of certainty as to choice of major field of study. In 1976, Sewell and Shah concluded that the level of educational attainment expected by the student was the single most important factor in persistence when ability was held constant. Astin (1964), Coker (1968), White (1971), and Astin (1976) agree with Sewell and Shah's conclusions that the higher a student's expectations, the less the chance of withdrawing from college.

Much of the research on the effects of grades has focused on students' obtained grades directly and on grade expectations indirectly. Glasser's (1969) "failure identity" speaks to the issue of low estimations of ability. Students who expect to do poorly gradewise, probably will. This concept relates to Marks' (1967) findings that students who anticipate poor grades and early withdrawal do drop out at significantly higher rates than do

those students who hold more positive expectations.

In 1968, Panos and Astin concluded that the declaration of a major does not predict completion of a degree program. Other studies have related certainty of educational major to intended career choice without drawing any conclusions as to the relationship between initial degree of certainty and persistence (Astin, 1965; Astin and Holland, 1961). As Tinto (1975) suggested, the issue may not be so much the degrees of certainty as to educational major that the students hold as they enter college, but the interactions within the college that lead them to a stronger commitment to a field of study.

Student/Institution Matches

In operating under the assumption that students will select a college or university with characteristics that will maximize his/her educational experience, the concept of matching the student with the institution becomes important. However, according to Astin (1976), examinations of the independent impact of student/institution mismatches are confounded by the interactive effects of students' demographic characteristics. For instance, the mismatch between a student's tuition limitations and the college's tuition and fee structure is mediated by the father's occupation and income, the contribution of the student through scholarship, employment, etc. In short, Astin's argument is that there is a problem in examining the relationship between two variables of the student/institution match concept--any given combination of the two variables will produce results different from those that would be obtained from the independent contribution of each.

College Residence

Of those factors of the college experience that have been shown to be related to attrition behavior, the student's place of residence is the most important (Astin, 1976). Among those who have concluded that students living on campus withdraw at a significantly lower rate than those who live off campus are Slocum (1956), Iffert (1957), and Astin (1973a, 1973b, 1976). Slocum's (1956) study found that students who lived in a fraternity or sorority had the lowest attrition rates of all students. While Iffert's (1957) and Astin's (1976) work supported this finding, Barger and Hall (1965) found no differences between fraternity/sorority students as compared to other students. Astin (1976) further reported that living with parents has a negative impact on persistence and that living in an apartment has an adverse effect on the persistence of female students, but not on male's.

CHAPTER THREE

METHOD

Subjects

Students who entered Kansas State University (KSU) as freshmen during the Fall Semester, 1976 were eligible to participate in this study. The subject population included students who met the following requirements: (1) initially entered KSU in the Fall Semester, 1976 having earned no previous college credit; (2) had recorded entrance data specified by KSU; (3) had completed the American College Testing (ACT) Program's Examination, Interest Inventory, and Student Profile Section; and (4) had completed an ACT Student Need Analysis Service application. The identification of such students was achieved through a series of data-tape merges. As such, anonymity was guaranteed. Six hundred twelve (612) students met the stated requirements.

The subject population was divided into groups in accordance with the following validation and identification scheme. Three-quarters (459) of the subjects served as the analysis group, with the remaining one-quarter (153) serving as the validation group. Subjects in both the analysis and validation groups were identified as persisters or nonpersisters based on their enrollment status Fall Semester, 1978. Accordingly, the following four groups were established:

Group I.	Analysis - Persisters	(N=330)
Group II.	Analysis - Nonpersisters	(N=129)
Group III.	Validation - Persisters	(N=111)
Group IV.	Validation - Nonpersisters	(N=42)

Data

The data analyzed in this study were obtained from the five sources previously mentioned: KSU entrance data; the ACT Examination, Interest Inventory, and Student Profile Section; and the Student Need Analysis Service. Preliminary descriptive statistics (frequencies, means, standard deviations, variances) were computed on 174 variables measuring student biodemographics, abilities, interests, needs, aspirations, and accomplishments as contained in the data sources. (A list of all variables and response formats can be found in Appendix A.) From the information contained therein, 76 variables were selected as likely predictors of a student's enrollment status. The selection was based on content and the amount of variance in the responses. (The variables selected for inclusion in the anlaysis are so designated in Appendix A.)

Analysis

A series of four discriminant analyses were performed using the Statistical Package for the Social Sciences (SPSS) Discriminant Analysis Subprogram (Klecka, 1975). Discriminant analysis is a statistical procedure designed to distinguish between two or more groups of cases based on a set of discriminating variables on which those groups of cases are expected to differ. The analysis mathematically weights and linearly combines the variables so as to force the groups to be as statistically different as possible. Discriminant function(s) (linear combination(s) of the discriminating variables) is/are formed to maximize the separation between groups using the equation

$$D_i = d_{i1}Z_1 + d_{i2}Z_2 + \ldots + d_{ij}Z_j$$

where D_i is the discriminant function i score, the d_i's are weighting coefficients, and the Z_j's are standardized values of the j variables used in the analysis. The desired condition is one in which the discriminant function scores for cases within a group are similar and the function scores between groups are different. The classification stage of the analysis involves the use of the discriminant function scores to predict group membership.

Two methods of discriminant analysis were used in this study: the stepwise selection method and the direct method. In a stepwise analysis, independent variables are selected for entry into the analysis based on their discriminating power. The procedure begins by selecting the single best-discriminating variable according to the criterion (enrollment status). A second variable is then selected as the variable best able to improve the discriminatory ability in combination with the first variable. Subsequent variables are similarly selected according to their ability to contribute further to the discrimination between groups. This procedure of selecting variables that improve discrimination given the variables already selected continues until a point is reached where the remaining variables make no further contribution to the discriminatory power of the variable set. At this point, further analysis is performed using only the selected variables. The direct discriminant analysis method enters independent variables into the analysis concurrently. In using this method, the discriminant function(s) is/are generated from the entire set of variables.

Procedural differences involving the handling of missing data were included in the analyses. Constraints of the statistical program

required a listwise deletion of cases with missing data, i.e. a missing value on any one discriminating variable caused the case to be excluded from the generation of the function(s). The program did contain a provision for the inclusion of those cases with missing data in the classification stage. Though the cases would not be involved in the generation of the function(s), they would be classified into a group based on their discriminant score which had been computed using the total mean(s) for the missing value(s). Analyses were performed including and excluding missing data.

In addition to the use of two methods of analysis and two procedures for handling missing data, two different assumptions regarding the population distribution of cases within the groups were considered. In one case no assumption was made as to the population distribution; in the other, prior knowledge as to the population distribution was used to adjust the probabilities of group membership as computed in the classification stage. National statistics (Astin, 1976) and the results of previous work with KSU students (Lynch and Downey, 1976) reported that 40% of an entering freshman class withdraw prior to the start of the fifth semester. As such, it was assumed that 60% of the students would be persisters, and 40% would be nonpersisters.

Operating under the assumption that the predictive capability of discriminant analysis is maximized through the selection of the best-discriminating variables, accurate and complete measurement of each case's values on those variables, and complete utilization of prior knowledge as to the population distribution, the following analysis schemes were established to test the ability of initial entry data to

differentiate between persisters and nonpersisters at KSU. In each analysis, the discriminant function was generated in the analysis group. The classification coefficients generated by the function were then used to predict the group membership of the validation group cases.

Analysis A. In this first and least definitive analysis in terms of the assumed maximum discrimination criteria, a stepwise selection discriminant analysis with no assumptions as to the population distribution and the inclusion of cases with missing data in the classification stage was performed on the 76 previously selected variables.

Analysis B. A direct discriminant analysis was performed entering those variables judged to be contributors by the stepwise procedure of Analysis A. Again, no assumptions were made as to the population distribution, and cases with missing data were allowed to enter the classification stage.

Analysis C. At this stage, a stepwise discriminant analysis was performed on the 76 variables selected on the basis of content and response variance. In this analysis, prior knowledge as to the population distribution was utilized; cases with missing data on the discriminating variables were not classified.

Analysis D. In this final and most definitive analysis in terms of the assumed maximum discrimination criteria, a direct analysis was performed entering those variables found to be contributors by the stepwise procedure of Analysis C. Prior knowledge as to the population distribution was utilized; cases with missing data on the discriminating variables were not classified.

CHAPTER FOUR

RESULTS

As outlined, four separate discriminant analyses were performed. In addition to the methodological differences among the analyses, there were two different sample sizes involved in the generation of the functions in these analyses. The statistical program utilized operated under a listwise deletion of cases with missing data. In the stepwise analyses (A and C), 76 variables were entered. Two hundred ninety-nine (299) cases had complete data and were used in the analyses. In the direct analyses (B and D), 25 of the 76 variables were entered. Three hundred forty-five (345) cases had complete data on these variables and were used in the analyses. As such, the results of the function generation stage of the analyses will be identical for Analyses A and C and for Analyses B and D.

Group and total means for the 25 predictor variables for the two analysis pairs are presented in Tables 1a and 1b.

The pooled within-groups correlation matrices for Analyses A and C and Analyses B and D can be found in Appendix B.

One function is the maximum to be derived from a two-group design. Presented in Tables 2a and 2b are summary statistics for the functions generated by Analyses A and C and Analyses B and D. The eigenvalue is a measure of the variance existing in the discriminating variables. By expressing this measure in terms of a relative percentage, the importance of a single function relative to the total discrimination which exists among the variables is indicated. Another

Table 1a

Group and Total Means for Predictor Variables
for Persisters (P) (N=214) and Nonpersisters (NP) (N=85)
for Analyses A and C

Variable	P	NP	Total
Sex	1.463	1.542	1.485
Live on Campus	1.402	1.330	1.381
Father - Farmer/Rancher	1.748	1.718	1.739
Parent's Household Size	5.224	4.800	5.104
H.S. English Grade	3.533	3.294	3.456
H.S. Mathematics Grade	3.224	2.823	3.110
ACT English	20.458	18.118	19.793
ACT Mathematics	23.626	19.200	22.368
Social Service Interest	46.570	49.482	47.398
Business Contact Interest	50.224	51.106	50.475
Certainty of Occupation	2.203	1.859	1.977
Need Help in Reading	1.799	1.682	1.766
Need Help in Study Skills	1.766	1.729	1.756
Need Help in Mathematics	1.701	1.612	1.676
Need Personal Counseling	1.696	1.635	1.679
Advanced Placement/Nat.Sci.	1.780	1.800	1.786
Credit-By-Exam/Nat.Sci.	1.631	1.741	1.662
Expect to Work	1.322	1.282	1.311
Community Size	3.434	3.694	3.508
Distance From College	3.397	3.144	3.324
H.S. Graduating Class Size	3.163	3.023	3.124
H.S. College-Prep Curr.	1.276	1.494	1.338
Semesters of H.S. Math	6.472	5.518	6.201
Music Accomplishments	2.473	2.718	2.535
College Extracurr. Plans	4.402	4.165	4.334

Table 1b

Group and Total Means for Predictor Variables
for Persisters (P) (N=242) and Nonpersisters (NP) (N=103)
for Analyses B and D

Variable	P	NP	Total
Sex	1.454	1.524	1.475
Live on Campus	1.409	1.330	1.385
Father - Farmer/Rancher	1.760	1.728	1.750
Parent's Household Size	5.178	4.796	5.063
H.S. English Grade	3.529	3.301	3.461
H.S. Mathematics Grade	3.207	2.854	3.101
ACT English	20.318	18.087	19.652
ACT Mathematics	23.508	19.485	22.307
Social Service Interest	46.905	49.058	47.548
Business Contact Interest	50.607	50.243	50.498
Certainty of Occupation	2.021	1.854	1.971
Need Help in Reading	1.781	1.670	1.748
Need Help in Study Skills	1.777	1.690	1.761
Need Help in Mathematics	1.686	1.582	1.655
Need Personal Counseling	1.678	1.650	1.669
Advanced Placement/Nat.Sci.	1.789	1.767	1.782
Credit-By-Exam/Nat.Sci.	1.657	1.709	1.672
Expect to Work	1.309	1.243	1.289
Community Size	3.467	3.767	3.556
Distance From College	3.405	3.146	3.275
H.S. Graduating Class Size	3.165	3.048	3.130
H.S. College-Prep Curr.	1.269	1.455	1.324
Semesters of H.S. Math	6.516	5.660	6.261
Music Accomplishments	2.397	2.544	2.440
College Extracurr. Plans	4.438	4.107	4.339

Table 2a

Discriminant Analysis Summary Statistics
for Analyses A and C

Function	Eigenvalue	Percent of Variance	Cummulative Percent	Canonical Correlation	After Function	Wilks' Lambda	Chi Square	df	Significance
1	.33939	100.00	100.00	.50338	0	.74661	83.136	25	0.000

Table 2b

Discriminant Analysis Summary Statistics
for Analyses B and D

Function	Eigenvalue	Percent of Variance	Cummulative Percent	Canonical Correlation	After Function	Wilks' Lambda	Chi Square	df	Significance
1	.29549	100.00	100.00	.47759	0	.77191	85.563	25	0.000

measure of the function's ability to discriminate among groups is the canonical correlation which measures the association between the individual function and a set of variables said to define group membership. Squaring the canonical correlation yields the proportion of the variance in each discriminant function explained by the groups. Twenty-five percent (25%) of the variance in the variables entering the stepwise analyses A and C is explained by the cases' group membership. Twenty-three percent (23%) of the variance in Analyses B and D is explained by group membership. Wilks' lambda and its associated chi-square test for the significance of the discriminating power in the variables which has not been accounted for in previous functions. As lambda increases, the discriminating power of the remaining information decreases.

The standardized discriminant function coefficients give a measure of the interpretive contribution of each variable to the function. The absolute value of the coefficient indicates its importance in the interpretation of the function. The sign indicates its direction toward the positive or negative end of the continuum of interpretive statements. These coefficients for the two pairs of analyses are presented in Table 3.

A discriminant score for each case is obtained by multiplying each of the standardized discriminant function coefficients by its respective variable (now in Z-score form) and summing. A mean discriminant score for each group, a group centroid, is then computed. A comparison of the centroids indicates the distance between the two groups with respect to the dimension established by the function.

Table 3

Standardized Discriminant Function Coefficients
for Analyses A and C and Analyses B and D

	Function I	
Variable	Analyses A and C	Analyses B and D
Sex	-.27	-.28
Live on Campus	.28	.24
Father - Farmer/Rancher	.20	.28
Parent's Household Size	.24	.28
H.S. English Grade	.17	.14
H.S. Mathematics Grade	.18	.08
ACT English	.19	.32
ACT Mathematics	.24	.13
Social Service Interest	-.32	-.30
Business Contact Interest	.19	.25
Certainty of Occupation	.17	.09
Need Help in Reading	.31	.23
Need Help in Study Skills	-.29	-.09
Need Help in Mathematics	-.21	-.11
Need Personal Counseling	.17	.07
Advanced Placement/Nat.Sci.	.29	.32
Credit-By-Exam/Nat.Sci.	-.20	-.07
Expect to Work	.16	.19
Community Size	-.44	-.56
Distance From College	.35	.38
H.S. Graduating Class Size	.39	.41
H.S. College-Prep Curr.	-.27	-.29
Semesters of H.S. Math	.26	.28
Music Accomplishments	-.20	-.15
College Extracurr. Plans	.31	.34

Table 4 presents the group centroids.

Table 5 summarizes the interpretive statements that are indicated by the standardized coefficients. The directionality of the statements remains the same across the pairs of analyses. The relative importance of the variables in the interpretive process fluctuates as can be seen in a review of Table 3.

The preceeding processes are part of the analysis stage of discriminant analysis. A final process, the generation of classification function coefficients, produces the information necessary for the prediction of group membership. Classification scores, generated from the mean discriminant scores and the within-groups covariance matrix, are converted into probabilities of group membership. A case is then assigned to the group to which it has the greatest probability of membership. The classification function coefficients for the analysis pairs are presented in Tables 6a and 6b.

The results of the classification stage of the analyses are presented in Tables 7a, 7b, 7c, and 7d. The outlining indicates the cases correctly classified based on those cases' weighted values on the discriminating variables.

In Analysis A, a stepwise discriminant analysis, 299 cases were involved in the generation of the function including 25 variables. In the classification stage, no assumption was made as to the population distribution, and cases with missing values were included. For the analysis group (N=459), 70.3% of the persisters were correctly identified, and 72.1% of the nonpersisters were identified (70.8% correct classification for the analysis group as a whole). When the classification function

Table 4

Discriminant Function Evaluated at Group Means (Group Centroids) for Analyses A and C and Analyses B and D

	Analyses A and C	Analyses B and D
Persisters	.36593	.35361
Nonpersisters	-.92128	-.83081

Table 5

Function Interpretations

Positive	Negative
- Live off campus - Father not a farmer - Large family - Higher grades in high school math and English - Higher ACT math and English scores - High interest in Business Contact - Not sure of occupational choice - No expressed need for help with reading - No expressed need for personal counseling - No interest in natural science advanced placement - Don't expect to work - Further from college to home - Larger high school graduating class size - More years of high school math - More college extracurricular plans	- Female - High interest in Social Service - No expressed need for help with study skills - No expressed need for help with math - No interest in natural science credit-by-examination - Large home community - Not from college preparatory curriculum - More music accomplishments

Table 6a

Classification Function Coefficients
for Analyses A and C

Variable	Persisters	Nonpersisters
Sex	.90	1.60
Live on Campus	10.63	9.88
Father - Farmer/Rancher	13.23	12.66
Parent's Household Size	2.01	1.84
H.S. English Grade	7.33	6.99
H.S. Mathematics Grade	1.41	1.14
ACT English	.31	.25
ACT Mathematics	.33	.28
Social Service Interest	.47	.51
Business Contact Interest	.51	.48
Certainty of Occupation	4.30	3.99
Need Help in Reading	10.15	9.19
Need Help in Study Skills	- 1.62	- .75
Need Help in Mathematics	.78	1.35
Need Personal Counseling	6.33	5.85
Advanced Placement/Nat.Sci.	15.25	14.35
Credit-By-Exam/Nat.Sci.	3.49	4.03
Expect to Work	5.63	5.18
Community Size	- .77	- .51
Distance From College	8.53	7.96
H.S. Graduating Class Size	1.61	1.25
H.S. College-Prep Curr.	10.83	11.57
Semesters of H.S. Math	3.51	3.32
Music Accomplishments	.30	.43
College Extracurr. Plans	.50	.34
(Constant)	-115.13	-135.88

Table 6b

Classification Function Coefficients
for Analyses B and D

Variable	Persisters	Nonpersisters
Sex	1.81	2.47
Live on Campus	8.99	8.41
Father - Farmer/Rancher	14.37	13.59
Parent's Household Size	2.17	1.99
H.S. English Grade	6.21	5.97
H.S. Mathematics Grade	.92	.81
ACT English	.45	.37
ACT Mathematics	.14	.12
Social Service Interest	.49	.53
Business Contact Interest	.45	.42
Certainty of Occupation	3.88	3.73
Need Help in Reading	8.82	8.17
Need Help in Study Skills	.21	.47
Need Help in Mathematics	1.55	1.85
Need Personal Counseling	6.46	6.28
Advanced Placement/Nat.Sci.	12.85	11.92
Credit-By-Exam/Nat.Sci.	4.77	4.96
Expect to Work	6.25	5.76
Community Size	- 1.29	- .98
Distance From College	8.50	7.93
H.S. Graduating Class Size	2.61	2.24
H.S. College-Prep Curr.	9.62	10.37
Semesters of H.S. Math	3.43	3.24
Music Accomplishments	.34	.43
College Extracurr. Plans	.59	.44
(Constant)	-141.73	-131.54

Table 7a

Predicted vs. Actual Group Membership - Analysis A

Actual	N	Predicted Persisters	Predicted Nonpersisters
Analysis-Persisters	330	232 (70.3%)	98 (29.7%)
Validation-Persisters	111	66 (59.4%)	45 (40.5%)
Analysis-Nonpersisters	129	36 (27.9%)	93 (72.1%)
Validation-Nonpersisters	42	25 (59.5%)	17 (40.5%)

Percent correctly classified: Analysis - 70.8% Validation - 54.2%

Table 7b

Predicted vs. Actual Group Membership - Analysis B

Actual	N	Predicted Persisters	Predicted Nonpersisters
Analysis-Persisters	330	229 (69.4%)	101 (30.6%)
Validation-Persisters	111	70 (63.0%)	41 (36.9%)
Analysis-Nonpersisters	129	36 (27.9%)	93 (72.1%)
Validation-Nonpersisters	42	23 (54.8%)	19 (45.2%)

Percent correctly classified: Analysis - 70.1% Validation - 58.0%

Table 7c

Predicted vs. Actual Group Membership - Analysis C

Actual	N	Predicted Persisters	Predicted Nonpersisters
Analysis-Persisters	242	197 (81.4%)	45 (18.6%)
Validation-Persisters	91	64 (70.3%)	27 (29.7%)
Analysis-Nonpersisters	103	41 (39.8%)	62 (60.2%)
Validation-Nonpersisters	31	21 (67.7%)	10 (32.3%)

Percent correctly classified: Analysis - 75.1% Validation - 60.6%

Table 7d

Predicted vs. Actual Group Membership - Analysis D

Actual	N	Predicted Persisters	Predicted Nonpersisters
Analysis-Persisters	242	199 (82.2%)	43 (17.8%)
Validation-Persisters	91	66 (72.5%)	25 (27.5%)
Analysis-Nonpersisters	103	40 (38.8%)	63 (61.2%)
Validation-Nonpersisters	31	20 (64.5%)	11 (35.5%)

Percent correctly classified: Analysis - 75.9% Validation - 63.1%

coefficients were applied to the validation group data (N=153), 59.4% of the persisters were correctly identified, and 40.4% of the nonpersisters were correctly classified (54.2% correct classification for the validation group).

When the 25 predictor variables of Analysis A were entered into a direct discriminant analysis (Analysis B), 345 cases were involved in the generation of the function coefficients. In the classification stage, no assumption was made as to the underlying population distribution, and cases with missing data were included. Within the analysis group (N=459), 69.4% of the persisters and 72.1% of the nonpersisters were correctly identified (70.1% correct classification for the analysis group). When the coefficients were applied to the validation group data (N=153), 63.1% of the persisters and 45.2% of the nonpersisters were correctly classified (58.0% correct classification for the validation group).

In Analyses C and D, a stepwise discriminant analysis and a direct discriminant analysis respectively, knowledge as to the underlying population distribution was utilized. Cases with missing data were excluded from both the function generation and classification stages of these analyses. In Analysis C, 299 cases were involved in the generation of the function coefficients. These coefficients were then used to classify the 345 cases in the analysis group who had complete data on the discriminating variables. Of the persisters in the analysis group, 81.4% were correctly identified by the classification scheme; 60.2% of the analysis nonpersisters were identified (75.1% correct classification for the analysis group). When the classification

function coefficients were applied to the data of the validation group (N=122), 70.3% of the persisters were correctly classified; 32.3% of the nonpersisters were identified (60.6% correct for the validation group). In Analysis D, each of the 345 cases in the analysis group were involved in the generation of the classification function coefficients that would be used to predict their group membership. In this case, 82.2% of the persisters were correctly identified; 61.2% of the nonpersisters were correctly identified (75.9% correct for the analysis group). When the classification function coefficients were applied to the validation group data (N=122), 72.5% of the persisters and 35.5% of the nonpersisters were identified (63.1% correct classification for the validation group).

CHAPTER FIVE

DISCUSSION

The use of discriminant analysis generally focuses on two separate but related functions: analysis and classification (Klecka, 1975; Spector, 1977). As the intent of the current study is to determine the extent to which high risk students can be identified on the basis of initial entry data, the following discussion will center predominantly on the classification function of the analysis with a somewhat more limited attention paid to the descriptive analytic function.

The interpretive structure of the function generated by the discriminant analysis provides a descriptive mode by which to evaluate persisters and nonpersisters. However, the degree to which accurate description, as well as classification, is achieved is dependent on statistical issues to be addressed later. As such, the following descriptive evaluations are tentative.

In evaluating the outline of interpretive statements for each group, the students who remained at KSU appear to have come from larger, nonagricultural families. These students probably came a longer distance at attend KSU, from a larger high school graduating class. Persisters had higher grades in English and mathematics with more years of mathematics preparation. The ACT mathematics and English scores for this group were higher also. The persisting students came to KSU with more extracurricular plans, less of an inclination to find a job. Although not sure of their occupational plans, these students expressed no need for personal counseling. As a group, the students did not express a need for help with reading skills.

The group of students who withdrew from KSU was probably disproportionately female. These students were more likely to have been enrolled in a high school curriculum that was not college preparatory in nature; they indicated more music accomplishments while in high school than did the persisters. Coming from larger communities, these students expressed a higher interest in Social Service. They were less inclined to express a need for help in mathematical skills or in developing study skills. As they entered KSU, they expressed a lack of interest in receiving credit-by-examination in natural science.

The descriptive implications of the analyses results provide a means of defining any underlying dimensions of differences between persisters and nonpersisters. However, at issue is the ability of such underlying dimensions to discriminate between the groups. A discussion of the results of the classification stages of the analyses speaks to this issue.

An examination of the classification results of the four discriminant analyses illustrates that, contrary to the original hypothesis, the predictive capability of the analysis in this study was not maximized through efforts to select the best discriminating variables, obtain accurate and complete measurement of each case's values on those variables, and completely utilize prior knowledge as to the underlying population distribution.

Analysis A was assumed to be the least definitive in terms of the criteria established to maximize the predictive capability of the discriminant analysis. Analysis B "bettered" Analysis A by including more cases in the generation of the classification function coefficients.

In the analysis group, the accuracy in identifying persisters decreased with the addition of cases; the accuracy remained the same for the analysis-nonpersisters. In the validation group, the percentage of persisters and nonpersisters correctly classified was increased with the inclusion of more cases in the generation of the function coefficients. Analysis D "bettered" Analysis C by including more cases in the generation of the classification function coefficients. In this analysis pair (C and D), where prior probabilities were utilized and cases with missing data were excluded, an increase in the number of cases involved in the generation of the coefficients increased the percentage of correctly identified persisters and nonpersisters in the analysis group and the validation group. The inconsistency in the effect of an increased number of cases in the derivation of a function has no obvious explanation.

Further inconsistencies in the predictive capabilities of the four analyses become evident when Analyses A and C and Analyses B and D are compared. In comparing the classification results of the two stepwise analyses (A and C), it appears that the use of prior knowledge as to the population distribution and the exclusion of cases with missing data improves the classification rates for persisters, but not for nonpersisters. In both the analysis group and the validation group, the percentage of persisters correctly classified by Analysis C, the more definitve analysis, was greater than the percentage correctly classified by Analysis A. However, Analysis A, which did not make use of knowledge as to the population distribution and included cases with missing data, successfully identified a greater percentage of

the nonpersisters in the analysis group and in the validation group. A comparison of the classification results of the direct analyses (B and D) reveals the same phenomenon. This raises a question as to a possible biasing effect of the methodology.

In Analyses C and D, care was taken to insure an accurate presentation of the data. Cases with missing data were eliminated; the analysis was given a realistic classification base on which to build (a 60/40 ratio for the two groups rather than the chance 50/50 ratio). In spite of these measures, the prediction rates for the nonpersisters dropped from those obtained in analyses where such caution was not taken. An explanation as to the reason for the differential effects of methodology on the identification of persisters and nonpersisters is elusive. It is possible that there is some systematic relationship between the cases in the nonpersister group and missing data. The absence of marked differences in the numbers of missing data cases for persisters and nonpersisters, and the inability to ascertain the specific variables for which values are missing make for speculation rather than explanation.

The inability to determine whether or not an increase in the number of cases involved in the generation of a discriminant function improves the predictive capability of the function and the inconsistencies concerning the classification of cases with missing data are evident in the classification results of the analyses. Perhaps an additional methodological issue becomes important in evaluating discriminant analysis schemes such as the present study's. Given the constraints of the statistical analysis, i.e. the listwise deletion of cases with

missing data, a concern arises as to the "cost" of including variables in a discriminant analysis. At some point, does the effect of eliminating cases with missing values on the variable in question outweigh the discriminating ability of the variable? Does the contribution of that variable to the variance accounted for by the function merit its inclusion given the resultant reduction in sample size? It is possible that the inclusion of any number of the variables entering in the final stages of the stepwise analyses offered a minimal increase in the discriminatory power of the analysis at the expense of a substantial number of subjects. The results of the current analyses fail to delineate a definite relationship among the number of cases involved in the generation of the function coefficients, the inclusion of cases with missing data, the use of prior knowledge as to the underlying population distribution, and the ability to classify cases according to group membership.

The failure of any one of the discriminant analyses to successfully identify members of the validation group as persisters or nonpersisters indicates that the two groups are not so distinct in terms of their initial entry data as was originally hypothesized. The lack of a close relationship between the functions and group membership suggests that there is more variation within the groups than between the groups on the variables under study. A finer distinction between persisters and nonpersisters may serve to make the groups more homogeneous and therefore lend themselves to more accurate identification. Work by Lynch and Downey (1977) found that persisters and nonpersisters, when categorized as being in good academic standing (2.0 or better on a

4.0 scale) or poor academic standing (less than 2.0), could be identified through the use of data similar to that used in the present study. Perhaps controlling for academic factors in the students' high school backgrounds as Astin (1973b) did would make persisters and nonpersisters more homogeneous as groups and more distinct in terms of some of the data examined in the current study.

A final issue to be addressed involves the group of subjects who participated in the study and the extent to which they can be considered representative of all entering KSU students. First it is assumed that the distributions of responses obtained from the group under investigation are comparable to those that would be generated by the population of entering students were the information known. A related point involves the possibility that there is a correlation between whether or not students had complete data and staying in or withdrawing from school. Of the 612 students, who as a result of having complete data on the sources under investigation participated in the study, 72% were persisters and 28% were nonpersisters. These percentages differ considerably from those reported by national (Astin, 1976) and local (Lynch and Downey, 1977) studies. The inflated percentage of persisters is evidence of a possible relationship between qualifying for participation in the study and enrollment status. It is not so much the content of the data at issue as the source of the data. KSU registration data are available on all students; the ACT Assessment, Interest Inventory, and Student Profile Section data are available on approximately 75% of the students; the Student Need Analysis Service data are available on approximately 25% of the entering students. Again, the content in

these sources may not be so important as the fact that it is available. Issue could readily be taken with the Student Need Analysis source. A relationship may exist between the filing of a financial aid application such as the Student Need Analysis and enrollment status. The data extracted from the Analysis were basic biodemographic data, but because they came from that particular source, they become qualified.

When considering implications for future research, an emphasis is placed on the need for more distinct groups. That the basic distinction of persisters and nonpersisters yielded relatively heterogeneous groups was evidenced in the current study. Care should be taken to avoid data sources that are, in and of themselves, highly correlated with group membership. Variables such as those used in the present study warrant the attention of future research so long as the source of those variables does not bias them in favor of or against prediction.

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Appendix A

Variable List and Response Format

Variable List and Response Format

	Variable	Response Format
	1. School Agriculture	1 = Yes; 2 = No
	2. School Architecture	1 = Yes; 2 = No
	3. School Arts & Sciences	1 = Yes; 2 = No
	4. School Business Administration	1 = Yes; 2 = No
	5. School Education	1 = Yes; 2 = No
	6. School Engineering	1 = Yes; 2 = No
	7. School Home Economics	1 = Yes; 2 = No
*	8. Residence	1 = Resident; 2 = Nonresident
*	9. Sex	1 = Male; 2 = Female
	10. Marital status	1 = Single; 2 = Married
	11. Year of birth	
*	12. Live on campus	1 = Yes; 2 = No
	13. Live in fraternity/sorority	1 = Yes; 2 = No
	14. Live off campus	1 = Yes; 2 = No
	15. Live with parents or relatives	1 = Yes; 2 = No
	16. Commute	1 = Yes; 2 = No
	17. College choice/aid	1 = First; 2 = Less than first
	18. Applicant's dependents	
	19. Full time/part time status	1 = Full time; 2 = Less that full time
	20. Welfare	1 = Yes; 2 = No
	21. Veteran	1 = Yes; 2 = No
	22. High school graduate	1 = Yes; 2 = No
	23. Spouse student status	1 = Spouse is a student 2 = Spouse is not student
*	24. Age of main wage earner	
	25. Occupation retired/disabled	1 = Yes; 2 = No
	26. Occupation professional/technical	1 = Yes; 2 = No
*	27. Occupation farmer/rancher	1 = Yes; 2 = No
	28. Occupation proprietor	1 = Yes; 2 = No
	29. Occupation clerical worker	1 = Yes; 2 = No
	30. Occupation sales worker	1 = Yes; 2 = No
	31. Occupation craftsman/foreman	1 = Yes; 2 = No
	32. Occupation operative	1 = Yes; 2 = No
	33. Occupation service worker	1 = Yes; 2 = No
	34. Occupation laborer	1 = Yes; 2 = No
	35. Occupation other	1 = Yes; 2 = No
*	36. Parent marital status	1 = Intact; 2 = Not intact
*	37. Parent household size	
	38. Parents dependents in post high school	
	39. Receive assistance in 1976	1 = Yes; 2 = No
	40. Applicants adjusted gross income	
	41. Assistance from applicant parents	

	Variable	Response Format
	42. Parents adjusted gross income	
*	43. Total parent/student contribution	
*	44. High school English grade	0 = F; 1 = D; 2 = C; 3 = B; 4 = A
*	45. High school math grade	0 = F; 1 = D; 2 = C; 3 = B; 4 = A
*	46. High school social studies grade	0 = F; 1 = D; 2 = C; 3 = B; 4 = A
*	47. High school natural science grade	0 = F; 1 = D; 2 = C; 3 = B; 4 = A
*	48. High school average	Computed from 44 - 47 above
*	49. ACT English	Standard score (range 20-80)
*	50. ACT Math	Standard score (range 20-80)
*	51. ACT Social Studies	Standard score (range 20-80)
*	52. ACT Natural Science	Standard score (range 20-80)
*	53. ACT Composite	Standard score (range 20-80)
*	54. II Science	Standard score (range 20-80)
*	55. II Creative Arts	Standard score (range 20-80)
*	56. II Social Service	Standard score (range 20-80)
*	57. II Business Contact	Standard score (range 20-80)
*	58. II Business Detail	Standard score (range 20-80)
*	58. II Technical	Standard score (range 20-80)
*	60. College choice/ACT	1 = First; 2 = Less than first
	61. Physical handicap	1 = Yes; 2 = No
*	62. Sure of major	1 = Very sure; 2 = Fairly sure; 3 = Not sure
*	63. Sure of occupational choice	1 = Very sure; 2 = Fairly sure; 3 = Not sure
*	64. Level of education	1 = Vo-tech; 2 = Two years; 3 = BS; 4 = MS; 5 = PhD
*	65. Estimated first year GPA	1 = 0.5-0.9; 2 = 1.0-1.4; 3 = 1.5-1.9; 4 = 2.0-2.4; 5 = 2.5-2.9; 6 = 3.0-3.4; 7 = 3.5-4.0
*	66. Need help with educ/voc plans	1 = Yes; 2 = No
*	67. Need help in writing	1 = Yes; 2 = No
*	68. Need help in reading	1 = Yes; 2 = No
*	69. Need help in study skills	1 = Yes; 2 = No
*	70. Need help in math	1 = Yes; 2 = No
*	71. Need personal counseling	1 = Yes; 2 = No
	72. Independent study	1 = Yes; 2 = No
*	73. Honors courses	1 = Yes; 2 = No
	74. Study in foreign country	1 = Yes; 2 = No
*	75. Advanced placement/English	1 = Yes; 2 = No
*	76. Advanced placement/Math	1 = Yes; 2 = No
*	77. Advanced placement/Soc. Stud.	1 = Yes; 2 = No
*	78. Advanced placement/Nat. Sci.	1 = Yes; 2 = No
	79. Advanced placement/French	1 = Yes; 2 = No
	80. Advanced placement/German	1 = Yes; 2 = No

	Variable	Response Format
81.	Advanced placement/Spanish	1 = Yes; 2 = No
82.	Advanced placement/Other language	1 = Yes; 2 = No
* 83.	Credit-by-exam/English	1 = Yes; 2 = No
* 84.	Credit-by-exam/Math	1 = Yes; 2 = No
* 85.	Credit-by-exam/Soc. Stud.	1 = Yes; 2 = No
* 86.	Credit-by-exam/Nat. Sci.	1 = Yes; 2 = No
87.	College instrumental music	1 = Yes; 2 = No
88.	College vocal music	1 = Yes; 2 = No
89.	College student government	1 = Yes; 2 = No
90.	College publication	1 = Yes; 2 = No
91.	College debate	1 = Yes; 2 = No
92.	College departmental clubs	1 = Yes; 2 = No
93.	College dramatics	1 = Yes; 2 = No
94.	College religious organizations	1 = Yes; 2 = No
95.	College racial/ethnic organizations	1 = Yes; 2 = No
96.	College intramurals	1 = Yes; 2 = No
97.	College varsity athletics	1 = Yes; 2 = No
98.	College political organizations	1 = Yes; 2 = No
99.	College radio/television	1 = Yes; 2 = No
100.	College fraternity/sorority	1 = Yes; 2 = No
101.	College special interest groups	1 = Yes; 2 = No
102.	College service organizations	1 = Yes; 2 = No
* 103.	Expect to apply for financial aid	1 = Yes; 2 = No
* 104.	Expect to work	1 = Yes; 2 = No
* 105.	Hours of work	1 = None; 2 = 1-10; 3 = 11-20; 4 = 21-30; 5 = 31 or more
* 106.	Community size	1 = Farm; 2 = Less than 500; 3 = 500-1999; 4 = 2000-9999; 5 = 10,000-49,999; 6 = 50,000-249,999; 7 = 250,000-499,999; 8 = 500,000-999,999; 9 = More
* 107.	Roman Catholic	1 = Yes; 2 = No
108.	Jewish	1 = Yes; 2 = No
* 109.	Protestant	1 = Yes; 2 = No
110.	Latter Day Saints	1 = Yes; 2 = No
111.	Other religion	1 = Yes; 2 = No
112.	No religious preference	1 = Yes; 2 = No
* 113.	Distance from college	1 = Less than 10; 2 = 10-25; 3 = 26-100; 4 = More than 100
114.	Afro-American	1 = Yes; 2 = No
115.	American Indian	1 = Yes; 2 = No
* 116.	Caucasian	1 = Yes; 2 = No
117.	Chicano	1 = Yes; 2 = No
118.	Oriental American	1 = Yes; 2 = No
119.	Spanish speaking American	1 = Yes; 2 = No
120.	Other ethnic	1 = Yes; 2 = No
121.	Type of college	1 = KSU match; 2 = Nonmatch
122.	Student body composition	1 = KSU match; 2 = Nonmatch

	Variable	Response Format
123.	Location	1 = Kansas; 2 = Other
124.	Tuition/cost	1 = KSU match; 2 = Nonmatch
125.	Student body size	1 = KSU match; 2 = Nonmatch
126.	Type of high school	1 = Public; 2 = Other
* 127.	Graduating class size	1 = Less than 25; 2 = 25-99; 3 = 100-199; 4 = 200-399; 5 = 400-599; 6 = 600-899; 7 = More
128.	School racial composition	1 = 10%; 2 = 11-25%; 3 = 26-50%; 4 = 51-75%; 5 = 76-90%; 6 = 91+%
129.	Class rank	1 = Top; 2 = Second; 3 = Third; 4 = Fourth
130.	Business curriculum	1 = Yes; 2 = No
131.	Vocational curriculum	1 = Yes; 2 = No
* 132.	College prep curriculum	1 = Yes; 2 = No
133.	Other/general curriculum	1 = Yes; 2 = No
* 134.	Years of Eglish	1 = Half; 2 = One; 3 = One-half; 4 = Two; 5 = Two-half; 6 = Three; 7 = Three-half; 8 = Four
* 135.	Years of Math	1 = Half; 2 = One; 3 = One-half; 4 = Two; 5 = Two-half; 6 = Three; 7 = Three-half; 8 = Four
* 136.	Years of Soc. Stud.	1 = Half; 2 = One; 3 = One-half; 4 = Two; 5 = Two=half; 6 = Three; 7 = Three-half; 8 = Four
* 137.	Years of Nat. Sci.	1 = Half; 2 = One; 3 = One-half; 4 = Two; 5 = Two-half; 6 = Three; 7 = Three-half; 8 = Four
138.	Years of Spanish	1 = Half; 2 = One; 3 = One-half; 4 = Two; 5 = Two-half; 6 = Three; 7 = Three-half; 8 = Four
139.	Years of German	1 = Half; 2 = One; 3 = One-half; 4 = Two; 5 = Two-half; 6 = Three; 7 = Three-half; 8 = Four
140.	Years of French	1 = Half; 2 = One; 3 = One-half; 4 = Two; 5 = Two-half; 6 = Three; 7 = Three-half; 8 = Four
141.	Years of other language	1 = Half; 2 = One; 3 = One-half; 4 = Two; 5 = Two-half; 6 = Three; 7 = Three-half; 8 = Four

	Variable	Response Format
	142. Years of Business	1 = Half; 2 = One; 3 = One-half; 4 = Two; 5 = Two-half; 6 = Three; 7 = Three-half; 8 = Four
	143. Years of Vocational	1 = Half; 2 = One; 3 = One-half; 4 = Two; 5 = Two-half; 6 = Three; 7 = Three-half; 8 = Four
*	144. HS Advanced placement/English	1 = Yes; 2 = No
*	145. HS Advanced placement-Math	1 = Yes; 2 = No
*	146. HS Advanced placement/Soc. Stud.	1 = Yes; 2 = No
*	147. HS Advanced placement/Nat. Sci.	1 = Yes; 2 = No
	148. HS Advanced placement/Language	1 = Yes; 2 = No
	149. HS Instrumental music	1 = Yes; 2 = No
	150. HS Vocal music	1 = Yes; 2 = No
	151. HS Student government	1 = Yes; 2 = No
	152. HS Debate	1 = Yes; 2 = No
	153. HS Publications	1 = Yes; 2 = No
	154. HS Departmental clubs	1 = Yes; 2 = No
	155. HS Dramatics	1 = Yes; 2 = No
	156. HS Religious organizations	1 = Yes; 2 = No
	157. HS Ethnic organizations	1 = Yes; 2 = No
	158. HS Intramurals	1 = Yes; 2 = No
	159. HS Varsity athletics	1 = Yes; 2 = No
	160. HS Political organizations	1 = Yes; 2 = No
	161. HS Radio/television	1 = Yes; 2 = No
	162. HS Fraternity/sorority	1 = Yes; 2 = No
	163. HS Special interest groups	1 = Yes; 2 = No
	164. HS Service organizations	1 = Yes; 2 = No
*	165. Adequacy of high school	1 = Inadequate; 2 = Below average; 3 = Average; 4 = Good; 5 = Excellent
*	166. Leadership accomplishments	Range 1 - 7
*	167. Music accomplishments	Range 1 - 7
*	168. Speech accomplishments	Range 1 - 7
*	169. Art accomplishments	Range 1 - 7
*	170. Writing accomplishments	Range 1 - 7
*	171. Science accomplishments	Range 1 - 7
*	172. Athletic accomplishments	Range 1 - 7
*	173. Community service accomplishments	Range 1 - 7
*	174. Work accomplishments	Range 1 - 7
	Computed variables:	
*	175. Foreign language	Sum of variables 138-141
*	176. College extracurricular plans	Sum of variables 87-102
*	177. Preferred college characteristics	Sum of KSU matches 121-125
*	178. HS Extracurricular activities	Sum of variables 149-164

* Allowed to enter stepwise analyses

Appendix B

Pooled Within-Group Correlation Matrices for Analyses A and C and Analyses B and D

Pooled Within-Groups Correlation Matrix for Analyses A and C

	1 - Sex	2 - Live on campus	3 - Father/Farmer	4 - Family size	5 - HS English	6 - HS Math	7 - ACT English	8 - ACT Math	9 - Social service	10 - Bus. contact	11 - Sure of occup.	12 - Help/reading	13 - Help/studying	14 - Help/math	15 - Counseling	16 - Af/Nat. Sci.	17 - CSE/Nat. Sci.	18 - Work	19 - Comm. size	20 - Distance	21 - Class size	22 - College prep.	23 - Semesters/math	24 - Music accomp.	25 - Extra. plans
1	1.00																								
2	-.11	1.00																							
3	-.05	-.01	1.00																						
4	-.14	.11	-.09	1.00																					
5	.23	-.02	-.06	-.15	1.00																				
6	.05	-.09	-.08	-.04	.39	1.00																			
7	.24	-.11	-.02	-.11	.37	.29	1.00																		
8	-.20	-.12	.07	.01	.26	.47	.54	1.00																	
9	-.04	.07	.06	.08	-.03	-.16	-.14	-.19	1.00																
10	.19	.02	-.07	-.03	-.03	-.13	-.14	-.27	.45	1.00															
11	.15	-.12	-.03	.06	.06	-.03	.13	-.05	-.09	.07	1.00														
12	.02	.00	-.01	.01	.13	.08	.24	.16	-.05	-.02	.06	1.00													
13	-.02	.01	-.04	-.01	.26	.24	.21	.27	-.14	-.06	.04	.40	1.00												
14	-.12	-.05	-.04	-.06	.20	.42	.19	.48	-.14	-.16	-.04	.18	.40	1.00											
15	.07	-.02	-.08	.05	.02	.08	.15	.11	-.04	-.02	-.13	.12	.19	.21	1.00										
16	.21	-.04	.01	-.02	-.16	-.09	-.08	-.19	-.07	-.03	.01	-.02	-.07	-.06	.08	1.00									
17	.21	.09	.01	-.08	-.03	-.11	.00	-.11	-.05	.04	-.03	.02	-.06	-.06	.09	.42	1.00								
18	.02	-.11	-.08	-.08	-.01	-.00	.02	.08	-.03	-.04	.10	-.04	.06	.09	.03	.16	.15	1.00							
19	-.01	-.05	.58	-.00	-.01	-.01	-.02	-.08	.06	-.05	-.14	-.06	-.01	.02	.04	.02	-.05	-.13	1.00						
20	.09	-.18	-.04	-.05	-.01	-.03	.03	.02	-.09	.02	-.03	-.09	-.09	-.08	-.06	-.05	-.05	-.05	.02	1.00					
21	.05	-.04	.43	.08	.03	-.04	-.03	-.09	.09	.00	-.06	-.16	-.02	.01	-.02	.04	-.03	-.06	.66	.03	1.00				
22	-.04	.05	.02	-.08	-.21	-.19	-.14	-.22	.10	.09	-.01	-.10	-.06	-.14	-.04	.11	.02	.08	-.07	-.00	.01	1.00			
23	-.19	-.09	-.05	-.00	.21	.40	.16	.54	-.13	-.17	-.09	.05	.20	.46	.04	-.23	-.14	.05	.00	-.03	.01	-.33	1.00		
24	.11	-.04	-.13	-.11	.12	.10	.09	-.03	.04	.08	-.04	-.00	-.03	-.08	-.02	.03	.04	.02	.20	.09	-.21	-.06	-.04	1.00	
25	.08	.04	.10	-.11	.01	-.07	-.04	-.14	.35	.29	-.02	-.19	-.12	-.23	-.10	-.18	-.15	-.11	.08	.06	.06	.06	-.08	.20	1.00

Pooled Within-Groups Correlation Matrix for Analyses B and D

	1 - Sex	2 - Live on campus	3 - Father/farmer	4 - Family size	5 - HS English	6 - HS Math	7 - ACT English	8 - ACT Math	9 - Social service	10 - Bus. contact	11 - Sure of occup.	12 - Help/reading	13 - Help/studying	14 - Help/math	15 - Counseling	16 - AP/Nat. Sci.	17 - CBE/Nat. Sci.	18 - Work	19 - Comm. size	20 - Distance	21 - Class size	22 - College prep.	23 - Semesters/math	24 - Music accomp.	25 - Extra. plans
1	1.00																								
2	-.12	1.00																							
3	-.04	-.00	1.00																						
4	-.15	.10	-.07	1.00																					
5	.17	.02	-.07	-.15	1.00																				
6	.05	-.05	-.07	-.05	.41	1.00																			
7	.22	-.08	-.03	-.12	.37	.29	1.00																		
8	-.20	-.08	-.07	.00	.30	.49	.52	1.00																	
9	-.02	.04	.06	.06	-.01	-.15	-.09	-.17	1.00																
10	.15	.04	-.07	-.01	-.01	-.10	-.14	-.22	.44	1.00															
11	.15	-.05	-.05	.04	.07	-.01	.12	-.02	-.13	.05	1.00														
12	.02	-.01	-.04	.03	.15	.11	.26	.19	-.04	-.01	.02	1.00													
13	-.03	-.01	-.05	-.04	.27	.23	.22	.26	-.11	-.05	.01	.43	1.00												
14	-.13	-.02	-.05	.01	.23	.41	.21	.49	-.14	-.15	.01	.23	.42	1.00											
15	.06	-.02	.06	-.04	.00	.09	.13	.11	-.03	-.06	-.14	.12	.15	.20	1.00										
16	.18	-.02	.00	.03	-.16	-.09	-.07	-.18	-.07	-.01	.03	-.00	-.05	-.06	.05	1.00									
17	.20	.07	-.01	-.08	-.09	-.13	.00	-.12	-.04	.05	.03	.02	-.01	-.06	.06	.44	1.00								
18	.04	-.11	-.08	-.09	.01	.02	.02	.09	-.03	-.03	.11	-.03	.05	.11	.02	.11	.12	1.00							
19	-.01	-.04	.59	-.01	-.02	-.01	.00	-.05	.03	-.08	-.13	-.08	-.01	.03	.03	.01	-.04	-.10	1.00						
20	.06	-.19	-.04	-.03	.00	.04	.02	.02	-.04	.02	-.00	-.09	.08	-.07	-.04	-.06	-.06	-.06	.01	1.00					
21	.07	-.04	.41	-.03	-.00	-.05	-.01	-.07	.06	-.03	-.04	-.16	-.05	.01	-.01	.00	-.04	-.02	.66	-.00	1.00				
22	-.00	.06	-.02	.09	-.21	-.19	-.16	-.23	.07	.10	-.00	-.10	-.09	-.15	-.02	.11	.04	.06	-.08	-.00	-.01	1.00			
23	-.20	-.04	-.04	-.00	.23	.39	.15	.54	-.15	-.16	-.05	.05	.19	.43	.04	-.17	-.11	.04	.03	-.03	-.08	-.06	1.00		
24	.11	-.08	-.15	-.11	.14	.09	.09	-.02	.06	.06	.03	.05	.01	-.04	-.01	.03	.05	.06	-.22	.08	-.21	-.06	-.06	1.00	
25	.12	.04	.10	-.11	-.01	-.05	-.05	-.17	.32	.26	.02	-.21	-.15	-.27	-.11	-.18	-.15	-.07	.07	.07	.07	.07	-.12	.16	1.00

THE USE OF INITIAL ENTRY DATA IN THE IDENTIFICATION OF HIGH RISK STUDENTS AT KANSAS STATE UNIVERSITY

by

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B.S., Kansas State University, 1973

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

College of Education

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1979

Each year approximately 2,600 students enter Kansas State University as freshmen. At least 40% of those students will withdraw from the University at some point prior to the beginning of their fifth semester. This study was conducted to determine the extent to which data available to the University at the time of students' initial entry can be used to identify students who are likely to withdraw.

Six hundred twelve (612) students who entered Kansas State University in the Fall Semester, 1976 participated in the study. Data measuring these students' biodemographics, abilities, interests, needs, aspirations, and accomplishments were entered into a series of four discriminant analyses for the purpose of classifying the students as persisters or nonpersisters as of Fall Semester, 1978. Operating under the assumption that the predictive capability of discriminant analysis is maximized through the selection of the best-discriminating variables, accurate and complete measurement of each cases' values on those variables, and complete utilization of prior knowledge as to the population distribution, the four analyses were progressively defined in terms of variable selection, inclusion of cases with missing data, and the utilization of prior knowledge as to the underlying population distributions.

The results of the analyses did not support the hypothesized maximum prediction criteria. Inconsistencies among the analyses results suggested differential effects of methodology on the groups. The inability of the analyses results to meet validation standards indicated that persisters and nonpersisters are relatively heterogeneous as groups, illustrating the need for more refined group

distinctions. The possibility of a relationship between the data sources and group membership was evidenced. Future efforts to classify entering students as likely dropouts will be strengthened through the use of well-defined groups and through the use of data sources that are not biased in favor of or against prediction.